

Tactical Mobility of the Medium Weight Force in Urban Terrain

A MONOGRAPH

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14. ABSTRACT

The potential for urban combat grows more plausible and probable as the world's population migrates toward cities and adversaries attempt to minimize the technological advantage of the U.S. military. Both emerging doctrine and the development of a full spectrum medium weight force ? known as the Interim Brigade Combat Team (IBCT) ? provide ample evidence that the U.S. Army acknowledges this increased potential for military operations in urban terrain (MOUT). Mobility and the dismounted infantry assault are the IBCT's two key operational capabilities. Since the IBCT provides an early entry combat force capable of decisive action to the war-fighting CINC, it must be capable of conducting immediate decisive, shaping and sustaining operations in urban terrain with its organic assets and capabilities. Both decisive and shaping operations require maneuver ? an element of combat power, however without mobility, the IBCT cannot maneuver. The IBCT's ability to conduct mobility operations tasks is directly linked to its mobility, ability to maneuver and capability to conduct decisive operations in urban terrain. This leads to the question: Does the IBCT have the capability to conduct the tactical mobility operations required to meet the demands of decisive offensive operations in urban terrain? This monograph reviews emerging U.S. Army doctrine, existing and emerging mobility assets and tactics, techniques and procedures (TTP), and the IBCT organization and employment concept to determine the organic mobility capabilities of the IBCT. A review of recent MOUT operations, lesson learned, and the emerging urban environment provide visibility of the mobility requirements of the IBCT and the environmental restrictions urban terrain places on a force. Next, the monograph analyzes the IBCT's organic mobility capabilities to determine their applicability to urban environment by assessing the feasibility, acceptability, and suitability of using the mobility capabilities in the emerging urban environment. This monograph concludes that the IBCT does not have the capability to conduct the tactical mobility operations required to conduct decisive operations in urban terrain. There are shortfalls in mounted and dismounted non-explosive mobility techniques, and quantities of specialized engineer mobility assets. These shortfalls limit the mobility, ability to maneuver and the decisive capability of the IBCT in urban terrain.

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Abstract

The potential for urban combat grows more plausible and probable as the world's population migrates toward cities and adversaries attempt to minimize the technological advantage of the U.S. military. Both emerging doctrine and the development of a full spectrum medium weight force – known as the Interim Brigade Combat Team (IBCT) – provide ample evidence that the U.S. Army acknowledges this increased potential for military operations in urban terrain (MOUT). Mobility and the dismounted infantry assault are the IBCT's two key operational capabilities.

Since the IBCT provides an early entry combat force capable of decisive action to the war-fighting CINC, it must be capable of conducting immediate decisive, shaping and sustaining operations in urban terrain with its organic assets and capabilities. Both decisive and shaping operations require maneuver – an element of combat power, however without mobility, the IBCT cannot maneuver. The IBCT's ability to conduct mobility operations tasks is directly linked to its mobility, ability to maneuver and capability to conduct decisive operations in urban terrain. This leads to the question: Does the IBCT have the capability to conduct the tactical mobility operations required to meet the demands of decisive offensive operations in urban terrain?

This monograph reviews emerging U.S. Army doctrine, existing and emerging mobility assets and tactics, techniques and procedures (TTP), and the IBCT organization and employment concept to determine the organic mobility capabilities of the IBCT. A review of recent MOUT operations, lesson learned, and the emerging urban environment provide visibility of the mobility requirements of the IBCT and the environmental restrictions urban terrain places on a force. Next, the monograph analyzes the IBCT's organic mobility capabilities to determine their applicability to urban environment by assessing the feasibility, acceptability, and suitability of using the mobility capabilities in the emerging urban environment.

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Part 1

Introduction

Overview

The trend toward MOUT seems irreversible--the U.S. military's next conflict probably will resemble past conflicts in Hue, Beirut, Belfast, Sarajevo, Mogadishu, and Chechnya more closely than Operation Desert Storm.

—Secretary of Defense, William Cohen¹

Military operations in urban terrain (MOUT) have historically been difficult, time consuming and resource intensive.² The US Army's heavy forces have neglected them over the past decade, and with rare exceptions since the beginning of the 20th Century. Experiences in World War I, World War II, Korea, Vietnam, Grenada, and Panama did not significantly influence the doctrine of how to fight mounted forces in urban terrain. In fact, these experiences seem to have had the opposite effect. Mechanized doctrine evolved into one that avoided or by-passed urban areas.³

The doctrinal aversion to using heavy forces in MOUT is changing. Recent operations such as those in Somalia, Bosnia, and Kosovo combined with the end of the Cold War - the degradation of the classic Soviet threat and the development of post-Cold War threat models – and the ongoing urbanization of much of the world's population increases the likelihood US forces will conduct operations in urban terrain. These events have generated a renewed interest in the use of heavier forces in MOUT.⁴ The Department of Defense and the Army

have recently determined that the capability to conduct military operations in urban terrain will be critical to conducting decisive military operations in the future. The Army's Interim-Brigade Combat Team (IBCT) operational capabilities include decisive operations in urban terrain.⁵

The IBCT also has a requirement to deploy and conduct military operations as an early entry force prior the arrival of follow-on forces.⁶ This implies that the IBCT must be capable of conducting decisive operations with its available resources. The Army recognizes that the volatile nature of global crises reduces the time required and available to deploy and integrate the combat arms of a ground force.⁷ In the near future, a strategically agile and responsive force will increasingly become one that has little opportunity to train with, or integrate augmenting active and reserve component forces before commitment into an area of operations and the conduct of decisive offensive operations.

The IBCT's ability to conduct decisive offensive operations directly correlates to its ability to maneuver.⁸ For the IBCT, maneuver translates to the ability to move combat force across the ground. The tactical mobility capabilities of the IBCT allow it to maneuver to the positions of advantage on the battlefield in order to conduct decisive offensive operations. For the IBCT, these tactical mobility capabilities are inherent in its equipment and the tactics, techniques and procedures (TTP) it uses to conduct mobility operations. The IBCT's ability to maneuver is inseparable from its ability to conduct tactical mobility operations. This leads to the question: Does the IBCT have the capability to conduct the tactical mobility operations required to meet the demands of decisive offensive operations in urban terrain?

Research Methodology

To determine if the IBCT has the tactical mobility capabilities that meet the mobility requirements needed to conduct decisive offensive operations in urban terrain requires an accurate understanding of the IBCT's mobility requirements and capabilities in that terrain. This in turn requires an assessment of the critical aspects of the urban operational environment, the historical and doctrinal employment of forces in urban terrain, the tactical mobility requirements of a medium weight force conducting MOUT, and the mobility capabilities within the IBCT. Once this assessment is complete, analysis will determine if the IBCT has the capability to conduct the mobility operations required to conduct decisive operations in urban terrain.

In view of the increased political sensitivity to non-combatant casualties and friendly losses, a major component of this analysis will be to determine if the mobility capabilities of the IBCT can or should be used in an urban environment. A review of each mobility asset and common mobility TTP the force could employ will determine if it is feasible, acceptable and suitable for use in an urban environment. This analysis requires subjecting each mobility asset or TTP to the following yes or no questions:

- Feasibility. Based on the nature of the mobility capability and urban environment, will the use of the mobility capability be effective in an urban environment?

- Acceptability. Based on the effects of the mobility capability and the nature of the urban environment, does the use of the mobility capability minimize any ancillary effects that would prohibit its use in an urban environment?

- Suitability. Based on historical analysis, lessons learned and mobility capability characteristics, will the use of the mobility capability in an urban environment create the required mobility effect?

The next step is to compare the IBCT's mobility capabilities and mobility requirements while conducting operations in an urban environment. This includes an integration of the mobility requirements drawn from lessons learned from historical MOUT and those generated from the doctrinal employment of the IBCT in an urban environment in accordance with the IBCT Organization and Operations document. The results of this comparison will demonstrate any potential shortfalls in mobility capability for the IBCT when conducting MOUT.

Further analysis will determine the impact of any shortfalls in mobility capability in MOUT. The overall affect of each potential shortfall should correlate to the battlefield organization model, and can be used to assess the impact on the IBCT's ability to conduct decisive, shaping and sustaining operations in urban terrain.⁹ High impacts are those that prohibit or degrade decisive operations. Medium impacts are those that prohibit or degrade shaping operations. Low impacts are those that prohibit or degrade sustaining operations.

The result of this analysis will determine the IBCT's mobility capabilities and potential shortfalls in an urban environment, and the impact on the IBCT's ability to conduct MOUT without additional mobility capabilities. As a final step, any shortfalls in mobility capability will be compared to the MOUT Operational Requirements identified by the DOD MOUT Advanced Concept and Technology Demonstration¹⁰ (ACTD), and the currently fielded mobility capabilities of the U.S. Army. If shortfalls in mobility capability are identified by the ACTD or if equipment exists that can provide the mobility capability, then solutions may be available in the near future to eliminate the shortfall in capability. If not, then prioritized solutions can be recommended.

Part 2

U.S. Army Doctrine and Mobility

The volatile nature of global crises requires Army forces to simultaneously train, deploy and execute, requiring commanders to conduct operations with early entry forces while assembling and preparing follow-on forces for decisive major operations.

- FM 3.0 Operations¹¹

Emerging U.S. Army doctrine places great emphasis on strategic responsiveness, and the ability to provide the Joint Forces Commander with early entry decisive capability.¹² Within full spectrum operations, battlefield organization arranges forces according to purpose, time, and space to accomplish the mission through decisive, shaping and sustaining operations. Decisive operations achieve the mission of the higher headquarters, and normally focus on maneuver. Shaping and sustaining operations set the conditions for the decisive operation. Shaping operations create and preserve the conditions for the success of the decisive operation and may include maneuver, while sustaining operations enable shaping and decisive operations.¹³

Since maneuver, an element of combat power, is normally the focus of decisive operations and an aspect of shaping operations, it becomes a critical component of full spectrum operations. *FM 3.0 Operations* defines maneuver as:

*the employment of forces on the battlefield through movement in combination with fire, or potential fire, to achieve position advantage in respect to the enemy in order to accomplish the mission.*¹⁴

By definition, maneuver requires movement. Ground-based forces move either mounted or dismounted. The speed of mounted and dismounted units is dependent on the type of terrain the moving unit has to cross, the capabilities individual soldiers or equipment they ride in, and the impediments to movement it finds along the way. Threat, societal, and physical impediments to movement affect ground, and non-ground based movement. For ground movement, physical impediments to movement must be by-passed or reduced to ensure maneuver.

This is the essence of U.S. Army mobility operations doctrine. Mobility operations support tactical mobility by overcoming - to include bypassing - physical impediments to movement. Mobility is “a quality or capability of military forces which permits them to move from place to place in order to fulfill their primary mission.”¹⁵ Regardless of the method or speed of movement, ground based units must conduct mobility operations when faced with physical impediments to movement. Unfortunately, with the exception of some infantry field manuals like *FM 90-10 Military Operations on Urbanized Terrain* and *FM 90-10-11 An Infantryman's Guide to Combat in Built-up Areas with Change I*¹⁶, there are few doctrinal references available that provide MOUT related mobility operations tactics, techniques and procedures.

Mobility Operations Doctrine

Mobility operations primarily focus on the reduction of obstacles by maneuver or engineer units to reduce or negate the effects of existing or reinforcing obstacles.¹⁷ According to *FM 5-101 Mobility*, U.S. forces conduct mobility tasks to obtain freedom of maneuver in five functional areas: countermine, counter obstacle, gap crossing, combat roads and trails, and forward aviation combat engineering.¹⁸

Of the five mobility task functional areas, four have a direct relationship to ground based movement and, therefore, ground based maneuver. For maneuver forces without aviation assets or support like the Interim Brigade Combat Team (IBCT), there is a direct relationship between the ability to maneuver and the ability to perform tasks in the counter mine, counter obstacle, gap crossing, and combat roads and trails functional areas. These mobility tasks support the movement and maneuver of combat forces during decisive, shaping, and sustaining operations.

FM 5-101's chapter on mobility support in special situations discusses counter mine and counter-obstacle planning considerations for the urban environment in general terms.¹⁹ It provides a discussion of the restricted nature of the urban environment,²⁰ and describes the movement of mounted and dismounted forces.²¹ According to these planning considerations, engineers support to maneuver forces well forward in offensive urban operations, and should be capable of reducing mines and obstacles under fire.

FM 5-101 also suggests that threat forces will frequently employ off-road or standoff mines due to the difficulty of burying mines in pavement, and that command-detonated mines and mines with trip wires and anti-handling devices will be used extensively against dismounted troops.²² *FM 5-101* does not discuss gap crossing and combat roads and trails in the urban environment, but this shortcoming does mean that these tasks do not have relevance in an urban environment.

Regardless of the type of physical impediment to movement, the first option is to go around or by-pass the impediment. The restricted nature of the urban environment may prohibit this option, and require the reduction of the impediment to movement.²³ The resources required to reduce the impediment depend on the type, size, location and composition of the impediment, and the situation.²⁴

Maneuver units can use a combination of specialized mobility equipment, organic assets, and TTP to reduce physical impediments. Each piece of specialized mobility equipment has unique capabilities and limitations. These capabilities and limitations enhance or limit its usefulness in meeting countermine, counter-obstacle, gap crossing, and combat roads and trails mobility task functional area requirements.

U.S. Army Mobility Systems and Equipment

According to the United States Army Engineer School, the proponent for mobility support, the Army fields specialized mobility systems and specialized mobility equipment. Mobility systems are typically organic to engineer units, while mobility equipment can be found in a variety of combat units. Two of the U.S. Army's specialized pieces of mobility equipment are mine clearing plows and mine clearing rollers. These two pieces of equipment mount only on the M1 tank. Plows create lanes through minefields while rollers detect minefields and proof lanes created by other means.²⁵

Fielded mobility systems include equipment that can support the full spectrum of mobility task functional areas. Countermining systems include lane reduction, mine detection, blast protection and lane marking equipment. The full width mine rake, MICLIC, and bangalore torpedo are fielded lane reduction systems.²⁶ Only the MICLIC and the bangalore torpedo have applicability for the IBCT since no M1s are organic to the IBCT.

There is only one system fielded for each of the following general areas: lane marking, blast protection, and mine detection. The hand-emplaced mine marking system (HEMS) can be used to mark lanes in obstacles and minefields, but is of limited value on improved and paved surfaces. The mine clearing armor protection (MCAP) kit protects the operator of D-7 bulldozers from blast hazards and small arms fire during obstacle clearance operations. The AN/PSS-12 mine detector²⁷ is capable of detecting the metallic content of many mines, but

cannot detect non-metallic mines, and cannot distinguish between the metal content of mines and scrap metal.²⁸

The only fielded counter obstacle systems are the M9 Armored Combat Earthmover (ACE) and the Grizzly, however other earthmoving equipment such as the D-7 Bulldozer and the Deployable Universal Combat Earthmover (DEUCE) can be used in this role.²⁹ Once clear of mines, mechanical earthmoving blades and attachments can reduce road craters, anti-tank ditches, wire obstacles, and piles of rubble and debris. With the exception of the Grizzly, these systems are also capable of constructing combat roads and trails forward on the battlefield.

Gap crossing systems include floating foot and vehicle bridges, armored launched bridges, fascines, and suspension bridges.³⁰ AVLBs and fascines³¹ are typically associated with standard task organized heavy combat organizations, while the rest of the wet and dry gap bridging assets are typically organic to specialized corps level units. Both the AVLB and fascine systems utilize an armored vehicle as a means of delivery that provides a level of protection not found in with other gap crossing systems, however neither system is organic to the IBCT.

The ribbon bridge and foot bridge are strictly used to cross wet gaps. The medium girder bridge (MGB) and Bailey Bridge can be used to cross wet and dry gaps, however bank height plays a significant factor in employment. Low bank heights can restrict use of the MGB and Bailey Bridge in both wet and dry gaps. The ribbon bridge and the MGB are the Army's currently fielded systems for crossing large gaps.³² While these bridges can be built to support the tactical mobility of forward units, the lack of armor protection increases the risk to the exposed troops constructing them.

There is an inherent risk involved in employing all mobility systems on the battlefield. Employment may expose troops to fires, and the mobility systems themselves can become high value targets for the threat. In order to mitigate risk to soldiers and mission success, mobility doctrine focuses ensuring redundancy and creating the conditions for the successful reduction of obstacles. In order to ensure success, engineer doctrine recommends that units use a redundancy planning factor of fifty percent. The TTP currently in use to synchronize breaching operations is known by the acronym SOSR-A. This acronym comes from the breaching operations methodology of suppressing the enemy, obscuring enemy observation, securing the lane reduction/crossing site, reducing the obstacle, and assaulting through the obstacle.³³

Mobility Tactics, Techniques and Procedures

FM 90-13-1 Combined Arms Breaching Operations is the doctrinal manual that provides a comprehensive explanation of the fundamentals of how to conduct SOSR-A in order to maneuver through an obstacle.³⁴ The SOSR-A methodology applies to all mobility operations to include river-crossing operations - only the scale of execution changes. In addition to a discussion of the SOSR-A methodology, *FM 90-13-1* provides a comprehensive explanation of TTP associated with a heavy force conducting breaching operations in relatively open terrain.³⁵ There is a noticeable lack of TTP for a heavy force conducting a breaching operation in restricted and complex terrain such as an urban environment.

FM 90-13-1 also lists multiple techniques for reducing obstacles and mines. The methods include mounted explosive and mechanical techniques, and dismounted techniques. Mounted explosive techniques include using the MICLIC³⁶, engaging obstacles with direct fire from mounted weapons systems³⁷, and placing charges against walls using blade assets.³⁸ Since the ACE and an MCAP equipped bulldozer are the only armored blade assets capable

of placing the charge under fire, using the DEUCE or other unarmored blade asset should be considered a high risk operation.

The mounted mechanical obstacle reduction techniques listed in *FM 90-13-1* include using mine clearing rollers and plows, mine rakes, fascines, and the AVLB. Additional mounted techniques include using a blade to skim surface emplaced mines, and an armored personnel carrier with a grapnel hook to remove wire obstacles. Skimming is a high risk method requiring skilled operators that uses the blade of a bulldozer, ACE or DEUCE to push mines from the intended path of movement. Buried mines and variations in the smoothness of the surface may hinder the effectiveness of this technique.³⁹

Removing wire obstacles using an armored personnel carrier (APC) and grapnel hook is an engineer squad battle drill. It can be effective in pulling mined wire obstacles out of the way of a moving force.⁴⁰ While it sounds rather simple, in practice it requires a well trained crew to ensure success on the first attempt. Throwing the grapnel hook accurately any significant distance from a moving or stationary vehicle is a challenge. Obtaining a secure hold within the obstacle with the grapnel is not a sure thing.

According to *FM 90-13-1*, manual reduction techniques require the use of hand-tools, hand-emplaced explosives, grapnel hooks, ropes, ladders, timbers, probes, mine detectors, and a variety of expedient materials.⁴¹ Soldiers utilizing these techniques must be well trained and extensively rehearsed since they are typically exposed to fires for five to thirty minutes depending on the mission and level of training⁴² - hence the 50 percent redundancy planning factor. Manual techniques can be used to reduce or overcome a variety of obstacles to include mines, wire, ditches, and vertical obstructions for both mounted and dismounted mobility.⁴³ The possible presence of anti-handling devices and doctrine precludes non-explosive ordinance soldiers from attempting to disarm or physically touch surface emplaced

or buried mines. U.S. Army doctrine states that mines should be detonated in place to reduce risk to soldiers.⁴⁴

The TTP for executing mobility tasks listed as viable in *FM 90-13-1* provide for a range of options depending on the type of impediment to maneuver. The employment of other expedient techniques and procedures may also work depending on the resources on hand and troops available. Initiative, creativity and the tactical situation may also produce workable techniques.⁴⁵

The U.S. Army Engineer School (USAES) is developing capabilities that support mounted and dismounted tactical mobility requirements. Developmental countermine and counter obstacle systems include the anti-personnel obstacle system (APOS), the countermine capability stock, and the obstacle marking system. Of the three, only components of the countermine capability stock (CCS) are available and in use. Components of the CCS include blast protection suits, mine probes, interim vehicle mounted mine detector systems, and proto-type remote control mine clearance equipment such as the Panther and the mini-flail. Both the obstacle marking system and APOS are concepts awaiting development.⁴⁶

Based on the increased likelihood of combat in urban terrain, USAES is also developing and defining new capabilities. New counter obstacle task capabilities include explosive and non-explosive obstacle reduction devices, and an urban rubble clearance system. Additionally, USAES is developing robotics technologies to support mobility tasks and sustaining operations.⁴⁷ This development of additional mobility capabilities is occurring in conjunction with the Department of Defense's MOUT ACTD. The ACTD lists four operational requirements related to the mobility task functional areas. The mobility related operational requirements include the following capabilities: get on top of building, detect /

disarm booby-traps, create man size hole in interior and exterior walls, and non-explosive breach of mines and other obstacles.⁴⁸

While these concepts of capabilities do not currently exist in the form of equipment or TTP, the operational requirements demonstrate that the Department of Defense has analyzed the urban environment, and determined the types of capabilities required to conduct decisive operations. Until these new capabilities are developed and fielded, the shortfalls will have operational and tactical ramifications for the current and emerging forces operating in an urban environment. How these shortfalls will affect the emerging medium weight force – the IBCT - will depend on the organic mobility capabilities found in its organization.

Part 3

Interim Brigade Combat Team

The new Army vision for strategic dominance across the full spectrum of operations establishes an explicit requirement for the Army of the 21st Century to become more strategically responsive. Meeting this requirement and providing the warfighting CINCs with an important new option for decisive contingency response is the central near-term objective of the Army's decision to develop full spectrum medium weight brigades, known as the IBCT. By design, the IBCT is a full spectrum, combat force. According to the Operations and Organizational (O&O) Document – based on extensive analysis – the IBCT has utility in all operational environments against all projected future threats, but it is designed and optimized primarily for employment in small scale contingencies (SSC) in complex and urban terrain, confronting low-end and mid-range threats that may employ both conventional and asymmetric capabilities.⁴⁹

Fully integrated within the joint contingency force, the IBCT deploys rapidly as an early entry force, and conducts combat operations immediately on arrival to prevent, contain, stabilize, or resolve a conflict through shaping and decisive operations. Decisive operations are defined in the O&O as:

Military operations that compel the enemy to submit to one's will are decisive operations. Achieving decision against symmetric adversaries in the foreseeable future will still require Army forces to seize, secure, and control terrain and to repel, eject, kill, or capture enemy forces. Decisive operations depend primarily upon the simultaneous, synchronized delivery

of precision fires and effects, coupled with exploitative maneuver, that leave the enemy incapable of physical or moral resistance.

- BCT O&O⁵⁰

The O&O also states that when employed within its optimal SSC environment, the IBCT's shaping operations can transition quickly to decisive operations without reinforcement by follow-on forces, and that decisive points in urban and complex terrain best suit the IBCT. According to the O&O, this is the environment where the IBCT will exploit its core capabilities for close combat and dismounted assault. The IBCT is empowered by situational understanding. Further emphasis is placed on the IBCT's core qualities of high mobility (strategic, operational, and tactical) and decisive action through dismounted infantry assault. Direct and indirect fire platforms support decisive operations, while situational understanding enables both. The major fighting components of the IBCT are the three motorized infantry battalions.⁵¹

The IBCT's likely operational environment includes a number of distinguishing features: urban/complex terrain; a weak transportation and logistical infrastructure, uncertain political situation; coalition involvement; and, the presence of an asymmetric threat including mostly mid- but some high-end technologies.⁵² Not surprisingly, this operational environment is virtually identical to the threats the Army has identified as likely in the future. This acknowledges the urban environment's importance both as operationally significant and likely location of future operations.

While the IBCT is not designed to have a forced entry capability, it provides the joint force commander an improved capability that arrives immediately behind forced entry forces, begins shaping operations and executes decisive action to expedite the decision. Once committed, the IBCT can sustain operations for up to 180 days without relief.⁵³ Design considerations balance capabilities for strategic responsiveness and requirements for full

spectrum operations. In essence, the O&O requires the IBCT be as deployable as a light force and have the effect and durability of a mechanized formation.⁵⁴

This same analysis also indicates that the IBCT's mission requires a different mix of capabilities than those found in traditional divisional brigades or brigades with their divisional slice organizations. Given this, the IBCT design includes embedded unit-based capabilities—military intelligence, signal, engineer, anti-tank, artillery, and CSS elements tailored specifically to the unique requirements of the IBCT mission set. This tailored design is supposed to increase force effectiveness in complex and urban terrain down to the combined arms company team level. According to the O&O, the most responsive mutual support requires integration of combined arms to the company team level rather than the brigade or battalion level.⁵⁵

Operations and Organization

Key Operational Capabilities

For the IBCT to operate successfully as a full spectrum force, the organizational design must reflect the key operational capabilities (KOC) and characteristics. The first two capabilities—mobility and dismounted assault (close combat centric) - are the IBCT's most distinctive, core qualities. According the O&O, they define the fundamental competencies of the IBCT, but do not diminish the significance of any remaining capabilities. This demonstrates the emphasis and importance of mobility and the decisive mechanism: dismounted assault.

The IBCT requires a high level of strategic, operational and tactical mobility. Strategically, the IBCT's organization, equipment and configuration must meet a 96-hour to theater deployment standard. Operationally, to provide the force commander flexibility,

hedge against uncertainty and exploit opportunities the IBCT must be capable of intra-theater deployment by ground/sea or by C130 air transport. At the tactical level, the success of the force requires overmatching mobility. The O&O states that the IBCT requires 100% tactical mobility.⁵⁶

In its SSC role, the IBCT requires the capability to move through and reposition in urban and complex terrain. Additionally, the tactical mobility capabilities must enable RSTA operations, and support striking the enemy in depth, rapid repositioning of a reserve, securing lines of communications, and conducting non-contiguous and distributed platoon, company, and battalion fights in urban and complex terrain.⁵⁷ According to the O&O, analysis indicates that a variety of armored or tracked vehicles can meet these mobility requirements for combat and combat support sub-units within the IBCT.⁵⁸

The capabilities of the IBCT's base vehicle are only part of the mobility equation. The IBCT must negotiate the impediments to movement that exceed the capabilities of the base vehicle. In other words, mobility operations using specialized mobility assets and/or TTP are an integral part of the IBCT's tactical mobility. The O&O fails to fully address the assets and capabilities required to enable 100% tactical mobility when discussing the IBCT's mobility overmatch.

Dismounted assault in the close fight is also a fundamental core competency. Analysis referenced in the O&O indicates that the IBCT achieves tactical decisions through combined arms operations at the company level focused on dismounted assault, supported by direct fires from organic vehicle mounted weapon systems integrated with mortar, artillery, mobility support, and joint fires/effects. According to the O&O, Infantry and the RSTA units provide a substantial dismount capability. This dismounted capability is supposed to link infantrymen and supporting weapons to produce a very responsive "point and shoot"

capability that permits successful engagement of fleeting targets in complex, urban and compartmented terrain using precise fires and effects that allow the IBCT to avoid collateral damage and non-combatant casualties. The dismounted infantry also increases the standoff of mounted weapon systems. This provides an increased level of survivability since the vehicles can avoid engagement by man-portable anti-tank fires.⁵⁹

The O&O fails to address the tactical mobility of the dismounted force when discussing this core competency. The dismounts like the mounted assets in the IBCT require the ability to negotiate physical impediment to movement in order to achieve 100% tactical mobility during the assault. Chapter 9, Maneuver Support, of the O&O provides the only indication of the relative importance of mobility operations, and mobility assets and capabilities to the overall tactical mobility of the IBCT. Throughout the rest of the O&O, discussions of the mobility of the elements of the IBCT center on the vehicle transporting the force.

The Interim Brigade Combat Team Organization

Based on the IBCT's orientation on SSCs in urban/close terrain and its core capabilities of mobility and dismounted assault, the IBCT organization, not surprisingly, is primarily resembles a mounted infantry organization. The IBCT organic organization includes three motorized combined arms infantry battalions⁶⁰; a RSTA squadron⁶¹; an anti-tank company⁶²; an artillery battalion; an engineer company; a brigade support battalion; a military intelligence company; a signal company; and a brigade headquarters and headquarters company. Only the engineer company has specialized mobility assets organic to its organization.

The primary combat platform for each of these organizations and other combat support units is the interim armor vehicle (IAV).⁶³ The Operational Requirements Document (ORD) for the IAV contains the tactical mobility requirements in the list of key performance

parameters. Tactical mobility requirements include the ability to sustain hard surface speeds of 40 miles per hour, ford wet gaps up to 1 meter deep and climb 18 inch vertical obstacles in forward and reverse, climb and descend 60 degree hard surface slopes, negotiate 30 degree hard surface side slopes, cross gaps up to one quarter vehicle length, and move 50 meters in 8 seconds from a standing start.⁶⁴

While the IAV key performance parameters provide some tactical mobility capabilities, these parameters obviously do not allow the IBCT to achieve complete freedom from physical impediments. The tactical mobility requirements of the IBCT that exceed the key performance parameters of the IAV require the IBCT to conduct mobility operations. The IBCT's engineer company provides the IBCT with the specialized capability to conduct these mobility operations.

According to the O&O, the engineer company's organization optimizes mobility support, and that this type of embedded support is required for sustained momentum. Given the significance of tactical mobility to the success of the IBCT this is not surprising. Issues connected with span of control and the complexity of its tasks indicate that the company organize as a brigade level asset. If the contingency situation requires counter-mobility, survivability, or construction support, these capabilities will be mission-tailored in engineer augmentation packages.⁶⁵

Mobility Systems and Equipment

The engineer company provides the IBCT with the specialized mobility assets required to conduct most mobility operations. The IBCT's infantry battalions and the RSTA squadron have additional equipment that can facilitate some mobility operations, but they have no specialized mobility equipment.⁶⁶ In order to understand the IBCT engineer company's

capability to support mobility operations, the company mission, organization, assets and capabilities require review.

The mission of the IBCT engineer company is two fold. For small scale contingency (SSC), the engineer company rapidly deploys world wide, and provides mobility and force protection support to the IBCT. When deploying to a major theater of war, and/or stability and support operation (SASO), the IBCT engineer company provides mobility and force protection support, and with augmentation provides additional mobility (lines of communications-LOC), counter-mobility, survivability, and sustainment engineering support to the IBCT.⁶⁷

This implies that the organic assets within the engineer company can provide the required mobility support to the IBCT for mounted and dismounted maneuver in an urban environment.⁶⁸ In order to accomplish the mobility mission, the O&O states that the IBCT engineer company is equipped with specialized mobility assets to reduce existing, natural, and reinforcing obstacles in open rolling terrain, and in complex and urban terrain. The inclusion of bridging assets within the engineer company provides the IBCT with enhanced mobility for limited dry and wet gap crossing.⁶⁹

The engineer company consists of three combat mobility platoons and one mobility support platoon. The combat mobility platoons are task organized to maneuver elements to provide mobility support to mounted and dismounted maneuver in urban operations. Total specialized mobility asset allocations within the combat mobility platoons include nine IAV with mountable rollers, plows and blades⁷⁰, nine 8-man engineer squads, six MICLICs, and associated engineer equipment, demolitions, and weapons. According to the O&O, the eight-man mobility squad is the minimum force required to provide effective dismounted maneuver support.⁷¹

The mobility support platoon consists of three identical sections that provide specialized engineer equipment. Equipment in the mobility support platoon includes six DEUCes, six bucket-loader/back-hoe variants, and three MGB bridge sections. When operated in conjunction with the maneuver force, the platoon facilitates freedom of maneuver, reduces force exposure to direct and indirect fires, and increases force effectiveness in complex and urban terrain. The platoon capabilities enhance force mobility in the forward area of operations through construction and repair of combat roads and trails, forward airfields, and landing zones, and reduction of enemy obstacles and fortifications. According to the O&O, the mobility support platoon does not operate independently in the offense like the combat mobility platoons. Its capabilities provide the commander with specialized equipment and capabilities to weight the main effort. Each section has in-stride breaching, gap crossing, lane obstacle reduction capabilities, specialized vehicle mounted tools, and heavy blades.⁷²

Based on the mission set of the IBCT, the potential for employment in an urban environment, and the reliance on tactical mobility, it is essential that the IBCT have the capability to maneuver and move in the urban environment. In order to determine if it does have the organic capability to operate effectively and decisively in an urban environment, defining the future urban environment becomes essential.

Part 4

The Urban Environment

There is little doubt that the population of the world is moving toward urban areas. The United Nations (UN) estimates that by the year 2030 over 61.1 percent of the world's population will be located in and around large urban centers.⁷³ The U.S. military and futurists view the population migration to urban population centers as a significant factor in their believe that future conflict in complex urban terrain is unavoidable and the norm.⁷⁴ The question for the tactical planner is: what will the urban environment of the future look like?

The UN categorizes the areas of population growth into three categories: most developed regions, less developed regions, and least developed countries.⁷⁵ The shantytown phenomenon described in Robert Kaplan's book *The Coming Anarchy* provides a stark illustration of the urbanization process in the UN's less and least developed countries⁷⁶. In the most developed countries, the urbanization process appears to follow a suburban model such as the one found between Boston and Washington, D.C rather than shantytowns. There is also a higher probability of social instability and unrest in the shantytown type of urbanization⁷⁷ than in the suburban urbanization of the most developed regions identified by the UN. Therefore, the most probable and challenging, but not exclusive, urban environment U.S. Army forces will face is some form of shantytown urban agglomeration.

What will the shantytown urban agglomeration look like? According to Kaplan's descriptions of the urban environments in West Africa and other third world urban locations

of the world, the shantytown urban areas of the future will be a central core city surrounded by a large hodgepodge of unregulated temporary construction that lacks infrastructure.⁷⁸ This description parallels the environments found in recent operations in Mogadishu, Somalia during Operation Restore Hope⁷⁹, and Panama City, Panama during Operation Just Cause.⁸⁰ There are even similarities with the descriptions of Grozny from the early 1990s when the Russians began their initial assault on the city.⁸¹ While every city is unique, these example cities and Kaplan's descriptions provide some insights into the general characteristics of the physical aspects of shantytown urbanization.

Physical Aspects

The physical disposition of shantytown urbanization will vary in density, organization, and infrastructure depending on the nature of the underlying terrain⁸², the size and composition of its old and modern construction, and population density. Essentially, they will be conglomerations of conventional old and new infrastructure surrounded by shantytowns consisting of unchecked unregulated construction with little to no infrastructure such as designated or paved roads or utilities. All of which will have an impact on mobility.

Based on Kaplan's descriptions of shantytowns, a generic physical layout of the atypical less or least developed country population center would include an old colonial city center surrounded by post-colonial modern buildings, strip areas, and suburbs. These generic sections of the city may intermingle and overlap so that distinct boundaries are not readily discernable. The shantytowns could form within or outside of the existing city structure.⁸³

Shantytown urbanization present numerous challenges to maneuver that will vary by the different features of the each section of the city. Starting in the older sections of the city, the roads may be narrow and winding, the buildings may be made of stone or other durable material with thick walls and ceilings, and the distance between structures minimal and only

interlaced with small alleyways. Buildings and structures bound what open areas that do exist - market areas, town squares, fountains, etc... Additionally, subterranean and multi-story structures may exist. In essence, operations in older parts of a city may be limited to purely dismounted elements.⁸⁴

In the more modern parts of the shantytown urban agglomeration, there may be additional subdivisions of land usage including centralized business districts and outlying residential and industrial districts. In the business district the roads may widen, the buildings may be constructed with less durable materials but may be taller (office buildings, manufacturing facilities or apartment complexes), and may be somewhat farther apart. Storm drains, sewer pipes, utilities and other subterranean features may be more prevalent and substantial. Business districts are more likely to be conducive to the use of armor and light skinned vehicles in a maneuver or support role, but the buildings and other features will require commitment of dismounted elements.⁸⁵

In the industrial districts, the distance between facilities may increase, but road networks are more likely to be wider and more conducive to the movement of large vehicles. The industrial facilities are more likely to be made of corrugated metal or some other poor construction material, and have large internal open areas in the buildings and between them. Power lines, fences, and industrial equipment and chemicals may be found both inside and outside buildings. Operations in industrial districts appear to support the use of armor and light skin vehicles for maneuver and support, but dismounted elements may be required to clear facilities since equipment, office walls, and other barriers may prevent actually driving through the interior of buildings.⁸⁶

The disposition and density of structures in outlying residential areas will vary, but some generalities will remain constant. Road networks will vary in width from a single to two lanes

laid either in straight lines or in curves depending on the underlying terrain. Residential buildings vary in size and shape depending on the intended usage (single, extended or multi-family) and regional norms (single or multiple floors). Construction material will vary from wood to concrete, but in general, concrete or masonry will dominate due to cost and simplicity of construction. Additional features that may exist in these residential areas include wood, metal or masonry perimeter walls, narrow alleyways, and interspersed park and recreational areas. Operations in outlying residential areas also appear to allow the limited use of armored and light skinned vehicles for maneuver and shaping operations, but road width and curvature could limit line of sight and freedom of maneuver.⁸⁷ High levels of collateral damage are more probable in these areas due to the increased likelihood of contact with family dwellings and families.

High levels of collateral damage are also a consideration in the shantytowns or urban slums. The disposition of shantytowns will vary, but Kaplan's descriptions of Abidjan, Ivory Coast, Conakry, Guinea and Ankara, Turkey provides some generalities that can be instructive. Structures are packed closely together, and assembled with scavenged material such as corrugated tin and metal, shipping containers and miscellaneous materials. Basic utilities such as running water, electricity, and sewage are limited to non-existent. Identifiable roads and pathways are unpaved and unimproved, and are prone to being used for sewage and trash disposal. The ad hoc nature of the shantytowns leads to a disorganized and unplanned geometry.⁸⁸ Operations in shantytowns may be limited to dismounted elements due to the inability to negotiate vehicles along roads and pathways, and the potential for vehicle related collateral damage.⁸⁹

With the possible exception of industrial areas, a significant civilian presence is likely in most of the areas discussed. The presence of the civilian population in the urban environment

leads to the conclusion that the physical aspects of shantytown urban agglomeration only tell part of the story. The civilian population and their interaction with potential adversaries also play into the equation.

Population Aspects

Lester Grau and Jacob Kipp of the U.S. Army Foreign Studies Office at Fort Leavenworth believe that the potential for U.S. forces to become engaged in urban conflict against guerrillas, terrorists and underdog armies is increasing.⁹⁰ These adversaries – singularly or in conjunction with each other - will attempt to use complex urban terrain to their advantage in order to mitigate the technological advantage of the U.S. military. The proximity of large numbers of civilians in an urban environment generates difficult moral dilemmas for both soldiers and leaders.⁹¹

It follows that the civilian population itself could become a significant player in the future urban environment. The civilian population and local national government can be supportive, non-supportive, or ambiguous, or a combination of the three to both U.S. forces, allies, and adversaries. According to Kaplan, shantytown populations may or may not have core value systems, ethnic homogeneity, or respect or trust in the local city, town, region, or national government.⁹² If the population of a shantytown does not have values, homogeneity, or trust in government, then the population could have a significant impact on the IBCT's ability to maneuver and employ its mobility capabilities.

The impediment to movement the population of a shantytown urban agglomeration could manifest itself in the form of mass demonstrations, civil disturbances, simple foot or wheeled vehicle traffic, or their simple presence on the urban battlefield. These impediments could occur due to the population's support of the threat force, a spontaneous reaction to the presence or actions of the U.S. force, or as a normal daily occurrence. Reducing or clearing

these population barriers may generate mobility requirements that exceed the capabilities or effectiveness of the explosive and mechanical assets of the IBCT. In fact, the mobility capability best suited to deal with this population obstacle may be civil affairs and psychological warfare assets.

The use of explosive and mechanical mobility assets pose a significant moral and physical challenge in the urban environment. Collateral damage caused by the use of explosive and mechanical mobility assets could create non-combatant casualties, or damage infrastructure.⁹³ Blast and overpressure effects of explosive devices that reduce obstacles such as line charges and fuel air explosives could have limited practical use in an urban environment. While this is primarily due to the negative connotations associated with non-combatant casualties generated due to the blast itself, it could be from secondary effects of cutting a water main or power line that results in health problems for the population.⁹⁴

The perception of needless subjection of the population of the city to violence or the effects of combat could affect public and world opinion.⁹⁵ Additionally, the population of the city may begin, or continue to support the threat forces based on these types of first and second order effects.⁹⁶ Galvanizing the civilian population of an urban environment against U.S. forces can only further complicate the challenges of conducting military operations in an urban environment.

Military Aspects

The threat, the U.S. Army's potential adversaries, can use both the physical environment and civilian population of urban terrain to their advantage. Lessons learned from Panama to Mogadishu to Grozny provide examples of both. While the population can take an active or passive role in supporting the threat, the physical aspects of the urban environment provide

the threat with an ample supply of existing physical obstacles. Reinforcing these physical obstacles using the existing resources of a city may impede both maneuver and movement.

Multi-story buildings, basements, utility lines, and other urban features combined with the underlying terrain enhance the effectiveness and utility of recently constructed conventional and unconventional obstacles. Conventional obstacles reinforce the existing infrastructure of a city by emplacing wire, mines, and other barrier materials in the form of obstacles along likely mounted and dismounted avenues of approach both inside and outside of structures.

Unconventional obstacles in a city use the existing materials and infrastructure of a city to impede movement. Toppling structures, concentrating rubble, creating surface gaps in subterranean cavities, and destroying existing bridges are ways to create significant obstacles to movement and maneuver using the existing infrastructure of a city. Burning tires and garbage, and positioning abandoned cars and vehicles in intersections, and employing other scrap materials on both subterranean and surface avenues of approach can create barriers to maneuver and movement that may be less significant, but just as effective.

Obstacles, however, are only one aspect of the urban environment challenge. In essence, the three dimensional urban environment increases the availability of cover, concealment, and obstacles while reducing a forces ability to observe and utilize fields of fire. Avenues of approach are limited in terms of width, length and direction.⁹⁷ The combined effect limits the ability of the force to maneuver, move, and conduct operations. By analyzing historical urban engagements and reviewing lessons learned, and then comparing them to the future urban environment, it should be possible to determine the mobility capabilities a force would need in order to conduct operations in the urban environment.

Part 5

Historical Lessons Learned

A 1994 report by Department of Defense identified a number of reasons why the U.S. Army avoids urban conflict. The reasons included a lack of detailed intelligence on urban areas, intensive manpower requirements, slow tempo of forces, and the desire to minimize casualties and damage to the city itself.⁹⁸ The experiences of the U.S. Army in Somalia, and the Russian Army in Chechnya do not effect the conclusions of this study, however they do provide some insights into the challenges of maneuver and movement in the urban environment. Combined with the accumulated urban warfare lessons learned of the U.S. Army and Marine Corps and the mobility TTP found in doctrinal publications, the mobility capabilities of a force conducting operations in an urban environment can be determined.

Chechnya

In September 1991, the Soviet Union felt the first pinning of what would become a violent example of modern urban combat when the Republic of Chechnya revolted and declared their independence⁹⁹. After three years of guerilla fighting against Soviet police and security forces by the Chechen rebels, Russian conventional forces deployed into Chechnya on 11 December 1994 to suppress the militant forces. By 01 January 1995, Russian mechanized forces were engaged in combat in the capital of Grozny. Chechen resistance would last 21 months.¹⁰⁰

Because of the initial failure to take Grozny, the Russians had to adapt to the urban environment. They developed tactics and techniques based on lessons learned to include the development of storm groups.¹⁰¹ Squads and fire teams, platoons, and companies were the basic maneuver elements that conducted tactical operations in the urban environment.¹⁰² The Russian's found that the mobility of wheeled armored vehicles was in some instances better than tracked armored vehicles in the urban environment.¹⁰³

The nature of the urban environment coupled with the abilities of the defending forces generated mobility requirements for the motorized infantry company that required the dedicated commitment of an engineer platoon.¹⁰⁴ Russian infantry soldiers also played an important role in meeting the mobility requirements of the storm group. Squads carried grappling hooks and rope, and lightweight ladders in order to enter buildings and structures at different levels.¹⁰⁵

The lessons from Chechnya provide a valuable insight into the mobility requirements of a modern motorized force conducting operations in an urban environment. Decisive action in the urban environment required the commitment of small units rather than large ones. The mobility requirements of these small units required engineer augmentation down to the squad level, and the use of specialized mobility equipment. The U.S. Army's experience in Somalia provides many similar lessons.

Somalia

In December 1992, United Nation Resolution 794 authorized the use of all necessary means to ensure food the distribution of food to starving Somali civilians.¹⁰⁶ The 10th Mountain Division (Light) was one element of the U.S. joint and multi-national response that was initially a peacekeeping mission, but evolved into peace enforcement. Both the 10th Mountain and U.S. Army Special Operations Forces were involved in bitter street fighting in

both Mogadishu¹⁰⁷, the capital, and Kismayu, a southern port city.¹⁰⁸ While the U.S. forces involved in urban operations in Somalia were essentially light, multi-national operations that included heavy units brought out many tactical mobility lessons learned that are applicable to the medium weight force.¹⁰⁹

Due to the Somali experience, 10th Mountain Division identified the requirement for specialized equipment to conduct military operations in urban terrain. To improve dismounted mobility, soldiers brought and used sledgehammers, axes, chain saws, and bolt cutters to create entrance holes in buildings and facilitate interior building movement.¹¹⁰ These types of equipment are not organic to infantry units in great quantities if at all.

Urban operations became squad orientated rather than platoon or company centric. The individual infantry soldier was fully engaged both mentally and physically as squads conducted forcible entry missions and carried the additional mobility equipment required to accomplish them. Engineer squads were organized and equipped similar to the infantry squads, but were generally tasked to conduct thorough searches of buildings utilizing heavier specialized equipment to rip up floors and excavate wells and shafts, and mine detectors to locate buried weapon caches.¹¹¹ Engineers in Somalia used expedient locally fabricated mobility assets to counter the mine threat along main supply routes and avenues of advance in cities.¹¹² While this was a successful improvisation, others were not so successful.¹¹³

The mobility lessons learned that emerged from Somalia provide a valuable insight into the mobility requirements of a medium weight force conducting operations urban terrain. These lessons are even more relevant since Mogadishu so closely approximates the physical descriptions of the shantytown urbanization. Many of the same lessons learned emerged over the last three years as both the U.S. Army and the Marine Corps began an intensive study of combat in the urban environment.

United States Army and Marine Corps Lessons Learned

The scope of MOUT lessons learned generated by both the U.S. Army and Marine Corps over the last few years provides a laundry list of challenges and TTP for dealing with the urban environment. One reoccurring theme indicates that well trained and versatile combined arms forces are a prerequisite for conducting successful operations in urban terrain.¹¹⁴ While this revelation is not earth shattering or unique to urban operations, it does tend to support the idea that the IBCF requires organic mobility capabilities versus a reliance on augmentation. A second reoccurring theme that indicates U.S. forces do not have an overwhelming technological advantage in the urban environment.¹¹⁵

Lessons learned by the U.S. Army and Marine Corps indicate that there is a technology gap in the mobility capability of both mounted and dismounted forces. The gap in mobility capability is directly related to mobility systems and equipment. According to the lessons learned, many of the existing mobility assets do not fully meet the requirements of the urban environment.¹¹⁶ Other lessons learned indicate that movement along streets is highly hazardous in the urban environment for both mounted and dismounted forces since the majority of casualties are on streets and in open areas.¹¹⁷ Defending threat forces may have many of the streets, alleys, and other open areas barricaded and covered by fire. The best avenues of approach are through existing buildings, across roofs, or in subterranean tunnels, sewers, and drainage systems, however these may be impassable due to obstacles, battle damage, or environmental reasons.¹¹⁸

In addition to the direct fire role against armored vehicles and fortified positions, lessons learned indicate that combat vehicles - tanks, Bradleys, M113s, AAVs (USMC), and LAVs (USMC) - have additional capabilities in the urban environment including smashing through barricades, establishing mobile roadblocks, acting as evacuation or civil disturbance

platforms, and logistics carriers. The dangers found in the urban environment impose some limitations on these additional capabilities. Maneuver space is limited and the three dimensional nature of the terrain can allow the enemy to close with and inflict serious if not fatal damage. To mitigate this threat, dismounted elements bear the responsibility for protecting armored and mechanized vehicles from enemy dismounted armor-killer teams.¹¹⁹

Combat engineer mobility assets, both dismounted and mounted, require the same protection. Since it is unlikely that armored vehicles can achieve all the mobility effects required to sustain mounted movement, lessons learned indicate that combat engineer equipment is necessary to support the movement of mounted forces.¹²⁰ Engineer mobility assets are required for more than just supporting the ability to maneuver. The requirement to evacuate casualties and re-supply units in contact in the urban environment also generates requirements for engineer mobility assets.¹²¹

Engineer units have always been a key component in MOUT.¹²² Not only do they provide many of the mobility assets required for successful maneuver and movement of support elements, they also provide the general engineer capability required to restore utilities and services to the city once it is secured. Therefore, it is not surprising that MOUT operations are historically engineer resource intensive.¹²³

While the IAV and the specialized mobility assets in the IBCT provide the tools to achieve tactical mobility, the IBCT must be able to accomplish the mobility operations TTP required to maneuver in the urban environment. Most of the historical based urban mobility TTP have comparable doctrinally based mobility TTP. Noted exceptions include using the mass of an armored vehicle to create holes in walls, fences and buildings, and using civil affairs capabilities as a mobility asset.

Part 6

Analysis

In order to analyze the mobility capabilities of the IBCT, it is necessary to understand the IBCT's true mobility capabilities. Based on the capabilities listed in the IBCT O&O, the equipment authorized by the IBCT objective TOE, and historical and doctrinal TTP, it is evident that the IBCT can conduct both mounted and dismounted mobility tasks. However, the IBCT's authorized equipment quantities and capabilities may prohibit the IBCT's ability to use and implement all the mobility TTP required to successfully conduct operations in the urban environment.

Mobility TTP Applicability

Mounted, the IBCT can reduce physical impediments to movement using a variety of techniques with its organic equipment to include mounted explosive techniques. While the DEUCE can place explosive charges using its blade, it does not have armored protection. Since the IAV will mount different weapons systems depending on the variant and the lack of hard data on the effects of those weapons on various obstacles, it is difficult to assess the effectiveness of direct fire engagement for mobility purposes. Of note, none of the variants requires a weapons system that uses munitions specifically designed for obstacle reduction.¹²⁴

The IBCT also has the ability to use mounted mechanical techniques within the capabilities of the each variant of the IAV. The full width blade and rollers on the engineer squad vehicle IAV variant may provide some capability.¹²⁵ The DEUCE and IAV with a grapnel hook provide more options.¹²⁶ Even the historical lesson of using an armored vehicle to reduce walls and other barriers may also be a possibility.¹²⁷ Unfortunately, none of these mounted mechanical techniques are proven effective, safe and reliable methods. They are generally considered high risk mobility TTP rather than first choice options.

The IBCT's dismounted infantry and engineers can use all the techniques identified in doctrinal references and historical lessons learned. Relatively long exposure times require extensive training to ensure effectiveness. While the majority of the equipment required to accomplish these dismounted tasks is organic to the IBCT, these techniques also include the use of expedient materials. The viability of relying on locally found expedients incurs risk since they may not be available. For example, there is no type classified collapsible ladder in the Army inventory, and there is no guarantee of finding or having the time to make a ladder.

The dismounted and mounted mobility TTP available to the IBCT are numerous, however there are some limitations. For dismounted mobility operations, only nine engineer squads are available to conduct these tasks. This allows the IBCT to task organize one engineer squad to each infantry company, or mass engineer effort to support to specified units leaving the some infantry companies without engineer support. This example ignores the dismounted mobility requirements of the RSTA squadron, the anti-tank company and other units within the IBCT.

Due to the high risk of exposure to fires during reduction missions, U.S. Army engineer planning factors call for fifty percent redundancy. In the case of engineer squads, this means each mobility operation task requires at least two squads to ensure success. Multiple

reduction missions in support of the same maneuver unit require commitment of even more resources to a single company. This further reduces the available engineer squads in the IBCT. At a minimum, each infantry company with a mobility operations task requirement would need two or more engineer squads. At best, with nine engineer squads, only four of the nine infantry companies could expect to receive engineer squad support.

The mobility operations tasks in unsupported infantry companies would revert to infantry squads. Infantry squads tasked to conduct mobility operations cannot concurrently conduct infantry tasks. In fact, infantry squads conducting mobility tasks may not be able to conduct subsequent infantry squad tasks. This degrades the shaping and potentially the decisive capability of the IBCT.

The same redundancy planning factors also apply to the mounted mobility operations capabilities of the IBCT with the same results. Planning factors indicate that for each asset task organized to reduce obstacles a second asset is also task organized.¹²⁸ In simple terms, six MICLICs can support two to three reduction missions.¹²⁹ These same planning factors apply to skimming and charge placing by the IBCT's six DEUCES.

The nature of the urban environment can also limit the use of the mobility TTP. The limiting factors include the physical, population and threat characteristics of the urban environment. Determining the feasibility, acceptability and suitability of using these various mobility operations TTP in urban terrain will provide the tactical mobility operations capabilities of the IBCT when conducting MOUT.

Feasibility¹³⁰

It is feasible to use all the dismounted mobility capabilities organic to the IBCT during MOUT, however the type of building construction may limit the use of explosive or expedient methods in older parts of the city. The nature of the urban environment may also limit the use of

mounted mobility capabilities. For example, the MICLIC's effectiveness in the older parts of the city and the shantytowns may be limited due to short lines of sight and the possible lack of 162 meters of straight road. Additionally, the narrowness of roads in older parts of the city may preclude the use of other mounted techniques. This also includes use of IAVs in the support or mobility role.

Based on the analysis of the rest of the shantytown urban model, it appears feasible to use all mounted and dismounted mobility capabilities. The IBCT's two gap crossing capabilities – the MGB and the IAV – are also feasible to use in many parts of the city. There may be limitations based on local variations in road width, line of sight, and physical characteristics that lead to the use of one technique over another, or in the case of gap crossing, eliminate the option of movement. The potential for collateral damage also poses problems in using the various mounted and dismounted capabilities. Resultant collateral damage to infrastructure, soldiers, and civilians may preclude the use of some techniques.

Acceptability¹³¹

For impediments within their capabilities to overcome, both of the IBCT's gap crossing capabilities are acceptable to use in the urban environment. There is a high degree of risk associated with the construction of the MGB in an urban environment. Construction exposes large numbers of soldiers to the effects of direct and indirect fire, and depending on the length of the gap could require one to two thirds of the engineer squads in the IBCT to construct. This in effect reduces the number of engineer squads available to support the dismounted and mounted mobility requirements of the IBCT.

In the absence of a non-explosive reduction technique for non-by-passable vertical barriers and threat emplaced reinforcing obstacles, dismounted techniques such as using the bangalore torpedo and expedient explosive charges may prove unacceptable in areas of a

shantytown urban environment that have a high civilian population density. In addition, the close quarters nature of urban fighting combined with the presence of U.S. soldiers may increase the likelihood of fratricidal injuries when using explosive techniques. In subterranean avenues of approach the use of explosives may cause infrastructure damage that could result in injury to U.S. soldiers or civilians. Tunnels and sewer systems could collapse. Explosions could sever water mains, electrical power lines, and gas lines. This further reduces the acceptability of using dismounted explosive reduction techniques.

The same collateral damage considerations are present when contemplating using mounted explosive techniques. The MICLIC, direct fire, and blade-emplaced charges have a significant collateral damage potential to combatants, civilians and infrastructure in an urban environment. A review of the shantytown urbanization model reveals only a few areas where explosive techniques may prove viable. These include the approaches to a city, open areas within a city and the industrial areas.

Dismounted non-explosive techniques appear acceptable in all areas of the urban model, however mounted non-explosive technique acceptability varies by sub-area and technique. Rollers and blades mounted on the ESV variant of the IAV, and skimming with the DEUCE may cause detonation of mines they encounter resulting in unacceptable collateral damage. Using the IAV, DEUCE or other vehicle to reduce vertical obstacles and enable movement could cause collateral damage to civilians and soldiers in buildings or on the opposite side of vertical barriers, however this collateral damage may be more isolated than that which results from explosive detonations. In open areas within the urban environment and in industrial areas, the level of risk decreases and these techniques become more acceptable, however they may not achieve the desired result.

Suitability¹³²

The mobility technique used to remove an impediment to movement and increase mobility must achieve a desirable result. The asset or technique must create a situation where either mounted or dismounted mobility increases. In the case of dismounted mobility it is potentially possible to achieve the desired mobility effect. When focusing in at squad level mobility tasks, the ability to achieve the desired mobility effect correlates to the amount of materials a squad can carry and the type mobility that the squad is trying to achieve – mounted or dismounted.

A squad could utilize both explosive and non-explosive methods to create achieve the desired effect in the majority of the sub-divisions of shantytown urban environment. The nature of the construction materials found in the older sections of a city could prohibit reduction of interior and exterior vertical obstructions. Stone masonry and thickly constructed concrete type materials could exceed the explosive carrying capabilities of a squad or platoon.

The capability to achieve the desired result using mounted mobility techniques will also vary depending on the physical nature of the impediment and the location within the urban environment. Mounted explosive techniques such as the MICLIC and direct fire are less likely to achieve the direct effect in the older sections of the city where space is limited. This lessens the likelihood of achieving both standoff and distance. Additionally, construction materials are likely to be more durable reducing the penetration by direct fire. The effect on blade-emplaced charges, however, will not be as great since the charge placement is directly against the vertical obstruction. The constricted nature of the older sections, shantytowns, residential areas of the shantytown urban model may prevent the blade asset's ability to actually get the charge close enough to the obstruction to achieve the desired result.

Mounted mechanical methods have limitations in these same sections of the shantytown urban model due the constricted nature of the terrain. The use of rollers, plows, blades, momentum, and grapnel hooks require maneuver room. The width of roads, length of approaches, and turn around space all play a role in limiting one or more of these techniques. In open areas of the urban model the effects of these factors dwindle and all mounted techniques have a higher probability of success.

The same limitations apply to the IBCT's gap crossing mobility capabilities. Within in the confines of what it can do and where it can go within the urban environment, the IAV can cross gaps and achieve the desired result of crossing a gap up to one quarter of its length. The MGB, if properly secured and constructed in the right location, can also achieve the desired result.

Assessment of IBCT Mobility Capabilities

The review of the feasibility, acceptability and suitability of the various mobility capabilities of the IBCT reveals shortcoming based on the characteristics of the urban environment. All explosive mounted and dismounted explosive techniques have some limitations. In some cases, more than one limitation exists. There is a direct link between the limitations identified in the assessment, and the location within an urban environment, the potential proximity to civilians, and/or the type of construction materials.

The same limiting factors apply to the mounted non-explosive mobility capabilities of the IBCT. Mounted non-explosive techniques appear to be more acceptable and suitable than mounted explosive techniques in most cases. Collateral damage using non-explosive techniques is probably less, however with the risk of exposing the IAV or DEUCE to direct anti-tank fire may negate this advantage.

The IBCT's dismounted non-explosive mobility capabilities appear to have the most utility in the shantytown urban model, however the dismounted mobility capabilities of the IBCT are effective against limited types of impediments to movement. The number of engineer squads able to execute mobility tasks and the potential loss of combat power that occurs when infantry are assigned these missions places additional restrictions on the tactical mobility of the IBCT.

The feasibility, acceptability, and suitability analysis illustrates a lack of viable explosive and mechanical mobility capabilities, and infers that there are an insufficient number of assets required to conduct operations in an urban environment. Dismounted non-explosive mobility techniques have the most utility across the urban environment, but the quantity of dedicated dismounted engineer assets, the physical limitations of hand carried and expedient tools, and the type of physical impediment limit their utility. This is especially true when dismounted techniques are used to support mounted mobility requirements. Not only is there an issue with the capabilities of dismounted mobility assets, the open areas where these tasks will occur exposes the dismounts to the possibility of direct and indirect fires.

Analysis indicates that mounted mechanical / non-explosive techniques to include the capabilities of the IAV have the second most utility in the urban environment. The mounted mechanical capabilities of the IBCT have the most utility in open areas within the urban environment where the assets can maneuver and find protection from direct anti-tank fires. In the close areas within the urban terrain, the lack of effectiveness against all potential impediments to movement limits the utility of these capabilities. The relatively small quantity of specialized mounted mobility equipment that cannot be replicated by other assets will also limit the IBCT.

Both the mounted and dismounted explosive mobility capabilities have the least utility in the urban environment. The aversion to friendly combatant and civilian casualties indicates

that, while effective in many areas, explosive techniques have limited utility in the urban environment. This is especially true in the shantytown, residential and old city sub-divisions of the shantytown urban model.

The utility of the IBCT's gap crossing capabilities also varies with the location within the urban model. The closer the terrain the less utility they have. The manpower requirements of the MGB and the potential exposure of the dismounts to direct and indirect fire limit its utility to outlying sections of the city and on line of communications leading to the city.

Part 7

Conclusions and Summary

Impact on Battlefield Organization

Based on the analysis in Part 6, the limitations of the mobility capabilities of the IBCT directly impact the IBCT's ability to conduct decisive, shaping and sustaining operations in an urban environment. The lack of engineer squads has the greatest impact on the decisive capability of the IBCT - the dismounted infantry assault. The relatively small number of engineer squads available to conduct mobility operations can lead to reductions of combat power in decisive and shaping operations. Additionally, without the ability to use all the explosive based mobility TTP, dismounted mobility techniques require more time and resources. In the urban environment, manpower is the mobility capability of choice and must be capable of overcoming impediments to movement. While bypassing the impediment may be an option that reduces time and resource requirements, it may expose dismounts to observation, and fires and place a greater emphasis on supporting the mobility requirements that facilitate IAV and indirect fires.

The O&O indicates that direct fire from the IAVs will support the dismounted assault. This direct fire support is a shaping operation that requires maneuvering the IAVs. Analysis indicates that the IBCT's mounted mobility capabilities may not support this requirement. The inherent limitations of the IAV and restrictive nature of the terrain limit IAV maneuver

in much of the urban environment. Bypassing while mounted may be an option in the open areas of a city, but as the terrain becomes more restrictive the chances of successfully bypassing also decrease. This highlights the lack of an armored blade asset with a non-explosive vertical obstruction reduction capability within the IBCT.

The effect on other shaping operations is more complicated. Shaping operations encompass a wide range of activities to include supporting effort combat operations, and combat support and combat service support tasks. Put in artillery terms, the mobility capabilities of the IBCT may not be able to service all the required targets. Again, the quantity and limitations of the IBCT's mobility assets are a shortfall.

The mobility requirements of the supporting effort combat operations may include the need for both dismounted and mounted mobility assets. With only nine engineer squads in the IBCT, it is not only conceivable, but also likely that some supporting combat operations will have to rely on mobility tasks performed by dismounted infantry squads or elements of other units. As indicated, this practice would tend to reduce the decisive combat capability of the IBCT. The same limitations on mounted mobility capabilities in more restricted sections of the city also exist.

The shaping operations of the RSTA will generate the need for more mobility capabilities. With no specialized mobility equipment, the RSTA squadron must rely on the mobility capabilities of its IAV variant and the use of dismounted mobility techniques for ground based movement. The RSTA squadron's reliance on stealth virtually eliminates dismounted explosive techniques as a viable mobility option.

Unless it receives support from the constrained resources of the IBCT engineer company, the RSTA must place great emphasis on bypassing impediments to movement that exceed the IAV's and non-explosive dismounted mobility capabilities. By default, this limits the ground reconnaissance assets to urban terrain that is not restrictive such as industrial

areas, open areas in the city, and potentially residential areas. Even with engineer support, the lack of non-explosive mechanical mobility assets capable of operating in these restricted areas of a city would limit the operations of the RSTA.

Sustaining operations of the combat support and combat service support units will generate a requirement for even more mobility capabilities. Combat support and combat service support units require unimpeded lines of communication during the conduct of decisive operations and supporting operations. At the minimum, these support units have mobility requirements that enable support for forward combat and combat support units. This support includes pushing supplies and assets forward, providing for evacuation of casualties and shifting of assets from one effort to another. The non-contiguous decentralized nature of MOUT and the optimization of support assets accentuate the additional mobility requirement.

From this discussion, it is clear that the mobility requirements of the IBCT's decisive, shaping, and sustaining will exceed the combined mobility capabilities of the IBCT when it operates within the shantytown urban model. Without the use of explosive dismounted mobility techniques, the IBCT's ability to conduct dismounted assaults in the restricted sections of the city with its available resources is questionable. The restrictions and limitations of the mounted mobility capabilities reduce the IBCT's ability to conduct shaping operations in these same restricted sections of the city. The multiple mobility requirements of sustaining operations combined with the IBCT's lack of a robust engineer organization that can simultaneously support decisive, shaping and sustaining operations represents the final tactical mobility challenge to the IBCT.

The lack of non-explosive specialized mobility assets designed to operate across the varied terrain found in the shantytown urban model and the limited number of engineer assets organized within the IBCT appear to be the most significant factors affecting the tactical mobility of the IBCT. The DOD MOUT ACTD and USAES have addressed some of the

equipment issues by identifying the requirement for additional dismounted capabilities and an urban rubble clearer, however these additional mobility requirements are currently in the concept phase. There are no specialized mobility systems in development under an active procurement program that meets the requirements of the IBCT.

The lack of specialized mobility assets further highlights the limitations of the IBCT engineer organization. Redundancy requirements for mobility assets demonstrate that the mounted and dismounted mobility capabilities of the IBCT are inadequate to support decisive and shaping operations by multiple units. The IBCT can increase its dismounted mobility capability by siphoning off its decisive combat capability, however the capabilities of the non-engineer IAV cannot replicate the specialized mounted mobility assets found in the IBCT engineer company.

Summary

The analysis of the emerging urban environment and U.S. Army operational doctrine, the IBCT organization and operations, and mobility capabilities and TTP shows that the tactical mobility requirements exceed the mobility capabilities of the IBCT when conducting operations in urban terrain. Shortfalls in equipment and organizational structure limit the tactical mobility of the IBCT. Equipment shortfalls include the lack of non-explosive specialized mobility assets that facilitate rapid movement of mounted and dismounted forces in urban terrain.

In order to ensure the IBCT has the required 100 percent tactical mobility, which supports the ability to maneuver and conduct decisive and shaping operations, there is an immediate requirement to begin the development and procurement of specialized mobility equipment. Dismounted operations require equipment that will enable getting on top of building, detecting and disarming booby-traps, creating man size hole in interior and exterior

walls, and the non-explosive breaching of mines and other obstacles. Mounted operations require equipment that will enable the non-explosive breaching of mines, obstacles and vertical obstructions without exposing troops or unarmored vehicles to enemy fires in the tight confines of the urban environment.

Organizationally, the limited number of specialized mobility assets assigned to the IBCT's engineer unit seriously affects the capability of the IBCT. The number of engineer squads is insufficient to support multiple operations requiring dismounted and mounted movement. This becomes especially critical when the IBCT operates in the restricted sections of an urban environment. Currently, with redundancy, the IBCT's engineer company can realistically only provide engineer squads to four infantry companies. This leaves five companies without dedicated and viable engineer support. An additional nine engineer squads could provide redundant dismounted engineer support to eight of the nine companies in the IBCT with no loss of decisive combat power. While this doubling of engineer squads appears to be the solution, it does not account for the dismounted mobility requirements of the RSTA and other units conducting shaping and sustaining operations.

Analysis of the quantities of the specialized mounted mobility assets in the IBCT indicates a similar shortfall. There are not enough assets in the IBCT engineer company to adequately support simultaneous decisive and shaping operations by the IBCT's infantry battalions. Doubling the number of assets provides enough capability support the requirements of the infantry battalions, but does not account for the requirements of other units conducting shaping and sustaining operations.

In order to ensure to meet all the tactical mobility requirements, the IBCT requires a minimum of three companies of engineers organized in a similar manner to the current IBCT engineer company. These companies, combined with the development and procurement of specialized mobility equipment designed to meet the mobility challenges of the emerging

urban environment, will be able to provide the IBCT with the tactical mobility required to conduct decisive, shaping and sustaining operations in urban terrain. Without an increase of this magnitude, the IBCT will be unable to conduct decisive operations in the environment in which it was designed to be most effective.

¹ Robert E. Podlesny, "MOUT: The show stopper," *Proceedings* 124, no. 2 (February 1998), 53. Quote attributed to William Cohen, Secretary of Defense.

² Lester W. Grau and Jacob W. Kipp, "Urban Combat: Confronting the Specter," *Military Review*, (<http://call.army.mil/call/fmsso/fmsopubs/issues/urbancombat/urbancombat.htm>), July-August 1999. Accessed 28 June 2000.

³ R.D. McLaurin, Paul Jureidini, David McDonald and Kurt Sellers, *Modern Experience in City Combat*, U.S. Army Human Engineering Laboratory: Defense Technical Information Center, March 1987, 13.

⁴ Jennifer Taw and Bruce Hoffman, *The Urbanization Of Insurgency: The Potential Challenge To U.S. Army Operations*, RAND, 1994, 31 - 38. The lack of a viable mechanized MOUT capability was identified in the mid-1980s, but no real action was taken to change doctrine. Also see Jennifer Taw and Bruce Hoffman's annotated bibliography on conventional military operations in urban terrain.

⁵ Department of the Army, *Brigade Combat Team (BCT) Organizational and Operations Concept (O&O) Document*, (<http://contracting.tacom.army.mil/majorsys/brigade/formalrfp/BCTOandO/bctoando.htm>), April 2000. Accessed 02 August 2000.

⁶ Department of the Army, *FM 3.0 Operations (DRAG Edition)*, (Washington D.C.: Government Printing Office, 15 June 2000), 3-2.

⁷ Ibid.

⁸ BCT O&O, Introduction.

⁹ FM 3.0, 4-22 - 4-23.

¹⁰ Department of Defense, SBCCOM, *Military Operations in Urban Terrain (MOUT) Advanced Concept Technology Demonstration (ACTD) Overview*, (<http://www.sbccom.army.mil/programs/mout/>). Accessed 21 June 2000.

¹¹ FM 3.0, 3-2.

¹² Ibid.

¹³ Ibid., 4-22 - 4-23.

¹⁴ Ibid., 4-3.

¹⁵ Department of the Army, *FM 101-5-1 Operational Terms and Graphics*, (Washington D.C.: Government Printing Office, 1997), 1-104.

¹⁶ Department of the Army, *FM 90-10 Military Operations on Urbanized Terrain*, Government Printing Office, 1979 and *FM 90-10-1 An Infantryman's Guide to Combat in Built-up Areas with Change I*, (Washington D.C.: Government Printing Office, 1993). FM 90-10-1 and FM 90-10 provide some generic tactics, techniques and procedures for tactical movement and maneuver of infantry soldiers and units in urban terrain, but do not fully address combined arms breaching operations in the urban environment.

¹⁷ Department of the Army, *FM 5-100 Engineer Operations*, (Washington D.C.: Government Printing Office, 1996), 1-104.

¹⁸ Department of the Army, *FM 5-101 Mobility*, (Washington D.C.: Government Printing Office, 1985), 1-3. FM 5-101 defines the five mobility task functional areas as follows:

Countermine. The detection, neutralization (by breach or bypass), marking, and proofing of mined areas; Counter-obstacle. The employment of tactics and equipment systems to breach or bypass and reduce obstacles other than mined areas; Gap-crossing. The crossing of gaps in the terrain in order to pass equipment and personnel; Combat roads and trails. The expedient preparation or repair of routes of travel for equipment or personnel; and Forward aviation combat engineering (FACE). The preparation or repair of landing zones, landing strips, or low altitude parachute extraction system (LAPES) sites to support aviation ground facility requirements in the forward battle area.

¹⁹ Ibid., 9-8. The planning considerations for the urban environment in FM 5-101 are vague. They focus on the urban terrain and potential enemy actions. For example, FM 5-101 discusses the avenues of approach leading to an urban area, and how they may provide multiple mounted avenues of approach that converge and become restrictive that limit by-passing either due to urban sprawl and adjacent natural terrain.

²⁰ Ibid. States that within a built up area, street patterns, building arrangement, open areas, and underground systems dictate and limit avenues of approach.

²¹ Ibid. As a general rule mounted forces move along streets, alleys, and open areas between buildings, while dismounted forces maximize cover by moving through buildings, underground, along edges of streets, and over roofs.

²² Ibid.

²³ Ibid.

²⁴ Ibid. FM 5-101's discussion of the types of resources required to reduce obstacles in an urban environment is vague. It basically states that the resources can range from muscle power (soldiers) to hand emplaced demolitions to specialized mobility equipment, and that improvising with locally procured materials and equipment designed for other purposes can also be effective.

²⁵ Ibid., C-3. Rollers are not primary system for minefield reduction since several mine detonations will destroy it, and it can skip areas due to variation in the smoothness of ground surface. The plow is only effective in sedimentary type soils. Pavement, rock and improved surfaces decrease effectiveness. Since both of these pieces of equipment are only capable of creating or proofing track width lanes, they have limited effectiveness against mines along their centerlines unless they are tilt rod activated. During mine clearing and proofing operations, operating speeds are limited to 5-10 miles per hour, and the vehicle must move in a straight line. Other limitations include the inability to use the roller or plows to push through deep road craters and anti-tank ditches.

²⁶ Ibid., B-3 - B-7. The mine rake is an M1 mounted lane reduction device only useful in sandy fine grain dry soil. The MICLIC is a rocket propelled explosive device that is effective against surface emplaced and buried mines, but requires a 162 meter straight line distance, and has significant blast hazard radius. The bangalore torpedo is a hand emplaced explosive device that is effective against surface mines, and has a blast hazard radius.

²⁷ The mine detector is the exception to the rule on mobility systems. It is organic to a variety of units in the Army.

²⁸ FM 5-101 Mobility, B-10 - B-14.

²⁹ The ACE is lightly armored. Neither the D-7 nor the DEUCE has armor protection, but the D-7 can be fitted with the MCAP.

³⁰ FM 5-101 Mobility, B-13 - B-15. With the exception of the armored launched bridge (AVLB) and fascines, the bridges in the Army inventory are not normally considered when discussing tactical mobility at the maneuver battalion, company or platoon level. The IBCT engineer company is an exception. It is allocated three MGB sections.

³¹ Ibid., B-15 - B-16. The AVLB provides an a heavy crossing capability that enables forces to cross dry or wet gaps less than 60 feet wide. Fascines (essentially pipe bundles), while not a standard item found in the current force structure, provide a heavy crossing capability that enables forces to cross dry gaps such as anti-tank ditches (less than 8 meter width).

³² Ibid., p. B-16 - B-17. The multi-role bridge company (MRBC) is equipped with both systems. An MRBC, with its organic assets, can emplace 215 meters of ribbon bridge, and two medium girder bridges up to 103 feet in length (one up to 163 feet). Both the ribbon bridge and the MGB can provide crossing capability that can accommodate 70-ton traffic. The foot bridge and Bailey Bridge are no longer found in active or reserve units. These bridges are now depot contingency items requested as needed.

³³ Department of the Army, *FM 90-13-1 Combined Arms Breaching Operations*, (Washington D.C.: Government Printing Office, 1991), 3-24.

³⁴ Ibid.

³⁵ Ibid.

³⁶ Ibid., C-2 - C-4. By design, the trailer mounted MICLIC reduces a lane in obstacles containing mines that is 100 meters long and 14 meters wide. It is effective on pressure activated mines, but may not completely eliminate deeply buried and non-pressure activated mines. These limitations generate the requirement to conduct post detonation proofing with rollers or blade assets to ensure the lane is free of mines. Stand-off and overhead clearance requirements reduce the MICLIC's effectiveness in restricted terrain.

³⁷ Ibid., C-4. While using direct fire to reduce obstacles is listed as a technique in *FM 90-13-1*, there is no discussion of effectiveness or limitations. The listed weapon systems include tank and infantry fighting vehicle main guns, machine guns, and 155 millimeter artillery pieces. While these may be viable options in some cases or as a last resort, using direct fire to reduce physically significant obstacles may not be cost effective.

³⁸ Ibid., C-6. Placing breaching charges with blade assets is an effective technique to reduce physically significant obstacles to movement. Rack mounted charges of up to 1,000 pounds are placed against wall or other vertical faced obstruction using a bulldozer, ACE, and DEUCE. The rack is a non-standard piece of equipment constructed as needed.

³⁹ Ibid., C-7 - C-8.

⁴⁰ Ibid., C-11. The APC approaches the obstacle, a crewman throws the grapnel hook into the wire, and the APC either backs away or reverses course.

⁴¹ Ibid., C-13. A variety of dismounted techniques to include explosive charges, bangalore torpedoes, and grapnel hooks are available to reduce vehicle and foot traffic lanes through surface emplaced minefields. Manual reduction of buried minefields requires the use of mine detectors and/or probes.

⁴² Ibid., C-12.

⁴³ Ibid., C-15. Some of the same techniques enable the reduction of lanes, along with other methods, in wire obstacles, ditches and vertical obstructions. Bangalore torpedoes, expedient explosive charges, wire cutters and grapnel hooks facilitate reducing wire obstacles. Grapnel hooks also assist in negotiating vertical obstructions when using ropes. Folding ladders and collapsible walkways are additional methods of overcoming vertical obstructions and wire obstacles. Reduction of ditches may require using one of the aforementioned techniques if dismounted, or the use of hand tools (shovels, picks, etc...) to create vehicle lanes.

⁴⁴ Department of the Army, *FM 20-32 Mine Countermeasure Operations*, (Washington D.C.: Government Printing Office, 1998), 3-5.

⁴⁵ *FM 90-13-1*, C-15. While improvising and initiative may achieve the desired mobility result, standardized mobility equipment and systems enable and facilitate familiarity, training,

and standardization. These benefits outweigh the costs associated with material development and acquisition. Both the Army and the Department of Defense are currently developing additional mobility equipment to ensure the military's tactical maneuver capability.

⁴⁶ U.S. Army Engineer School, *Developmental Systems*, (http://www.wood.army.mil/DCD/nolimits/ENDIV/EN_Material/material_page.htm). Accessed 02 August 2000.

⁴⁷ U.S. Army Engineer School, *Engineer Prioritization Paper*, (http://www.wood.army.mil/eschool/priorization_paper.htm), 18 June 1999. Accessed 02 August 2000.

⁴⁸ MOUT ACTD.

⁴⁹ BCT O&O, Introduction.

⁵⁰ Ibid.

⁵¹ Ibid.

⁵² Ibid.

⁵³ Ibid.

⁵⁴ Ibid. According to the O&O, analysis demonstrates that enhancement of the IBCT's ability to accomplish its mission requires embedding combat support and combat service support capabilities into the organic organization. Further, this analysis also shows that employing non-organic division and corps elements to meet CS and CSS requirements unnecessarily enlarges the IBCT's deployment requirements. Thereby increasing the IBCT theater footprint and introducing different vehicle types and equipment sets into the structure, violating commonality, and increasing sustainment and infrastructure requirements.

⁵⁵ Ibid.

⁵⁶ Ibid. In other words, the IBCT requires a mobility capability that equals that of a mechanized formation operating in high end distributed operations in open and rolling terrain.

⁵⁷ Ibid.

⁵⁸ Ibid.

⁵⁹ Ibid.

⁶⁰ Ibid., Chapter 5. The infantry battalions, supported by combined arms integration across the Brigade that extends into the rifle companies, are the primary maneuver elements within the IBCT. Each battalion has three combined arms rifle companies and a headquarters company. Additionally, the infantry battalions have snipers, mobile gun systems, mortars, and Striker-equipped fire support teams. These assets provide the combined arms integration vital to support dismounted operations by squads, platoons and companies, including dispersed actions.

⁶¹ Ibid., Introduction. The RSTA squadron is a unique organization developed specifically to satisfy a set of unique operational requirements generated in the analytical process. It is the IBCT's primary source of combat information. The squadron supports the development of situational understanding, empowering the IBCT to anticipate, forestall, and dominate threats, ensuring mission accomplishment through decisive action and freedom of maneuver. The squadron consists of three ground reconnaissance troops and a surveillance troop. Each ground reconnaissance troops includes JAVELIN anti-armor and 120 mm mortar support. The surveillance troop includes a UAV platoon, a ground sensor platoon, and an NBC reconnaissance platoon. Combining the capabilities of the squadron, it can simultaneously reconnoiter nine routes or conduct surveillance of 18 designated areas on a continuous 24-hour cycle. The squadron operates by stealth throughout the entire AO, and employs HUMINT and counter-intelligence experts comprehensively to compensate for shortfalls in existing sensor capabilities - suited for open terrain and unit/force-based information.

⁶² Ibid. The anti-tank (AT) company comprises the IBCT's primary tank-killing capability. It provides stand-off fires against enemy armor. The company increases IBCT flexibility and

improves its survivability, particularly in open terrain. The company consists of three platoons, each with four long-range, fire and forget, TOW IIB systems mounted on IAVs.

⁶³ Department of the Army, Tank and Automotive Command (TACOM), *Interim Armored Vehicle (IAV) Operational Requirements Document (ORD)*, (<http://contracting.tacom.army.mil/majorsys/brigade/formalrfp/iavord/>), 26 April 2000. Accessed 25 August 2000. The IAV will serve as the platform for infantry carriers, mobile gun platoons, mortars, RSTA elements, anti-tank carriers, 155mm self-propelled cannon artillery, engineer mobility support vehicles, NBC reconnaissance, and most of the command and control carriers within the Brigade. The specific IAV platform has not been determined, and testing is currently on going.

⁶⁴ Ibid.

⁶⁵ BCT O&O, Introduction.

⁶⁶ Department of the Army, Force Management Support Agency, Requirements Documentation Directorate, *Brigade Combat Team (BCT) Tables of Organization and Equipment (TOE)*, (<http://www.usafmsardd.army.mil/ibde/content.htm>), 15 June 2000. Accessed 20 August 2000. The base and objective Table of Organization and Equipment (TOE) for the infantry battalions and RSTA squadron do not list any specialized mobility equipment. There are demolition kit bags and hand tools listed. These items can be used to reduce lanes in some obstacles, but it is not their primary purpose.

⁶⁷ BCT O&O, Chapter 9. While not specifically stated, this implies that the IBCT engineer company only requires mobility augmentation to conduct the additional LOC mission.

⁶⁸ Ibid. The wording of the O&O indicates that the IBCT engineer company can accomplish its mobility tasks, with the exception of LOC missions, with its organic equipment in SASO, SSC, and MTW scenarios. These mobility tasks are in support of mounted and dismounted maneuver in open, complex, and urban terrain.

⁶⁹ Ibid.

⁷⁰ Department of the Army, Tank and Automotive Command, *Interim Armored Vehicle (IAV) Operational Requirements Document (ORD), Annex A, Appendix 5, Engineer Squad Vehicle Variant*, (<http://contracting.tacom.army.mil/majorsys/brigade/formalrfp/iavord/Appendix%205%20to%20Annex%20AEngr%20Sqd%20Veh%2022%20FEB.doc>), 26 April 2000. Accessed 25 August 2000.

⁷¹ BCT O&O, Chapter 9.

⁷² Ibid.

⁷³ United Nations, Department of Economic and Social Affairs Population Division, *Urban and Rural Areas 1996*, (<http://www.undp.org/popin/wdtrends/ura/furatoc.htm>). Accessed 02 August 2000.

⁷⁴ Department of Defense, "The Urban Century: Developing World Urban Trends and Possible Factors Affecting Military Operations," MCIA-1586-003-97, Defense Intelligence Reference Document, November 1997; Department of Defense, "Report of the Defense Science Board Task Force on Military Operations in Built-Up Areas (MOBA)." Office of the Secretary of Defense for Acquisition and Technology, Washington, D.C., November 1994; and Russel W. Glenn, "Combat in Hell: A Consideration of Constrained Urban Warfare." RAND monograph MR-780-A/DARPA, 1996.

⁷⁵ United Nations. More developed countries are defined as all regions of Europe and Northern America, Australia/New Zealand and Japan. Less developed regions comprise all regions of Africa, Asia (excluding Japan) and Latin America and the Caribbean, and the regions of Melanesia, Micronesia and Polynesia. As of 1995, the least developed countries as defined by the United Nations General Assembly, comprise 48 countries, of which 33 are in Africa, 9 in Asia, 1 in Latin America and 5 in Oceania. They are also included in the less developed regions.

⁷⁶ Robert D. Kaplan, *The Coming Anarchy: Shattering The Dreams Of The Post Cold War* (New York: Random House, 2000), 10 - 14.

⁷⁷ Taw and Hoffman, 11 - 12.

⁷⁸ Kaplan, 10 - 18.

⁷⁹ Mark Bowden, *Blackhawk Down: a story of modern war* (New York: Simon and Schuster, 1999), 27 - 35.

⁸⁰ Caleb Baker, Thomas Donnelly and Margaret Roth, *Operation Just Cause: The Storming of Panama* (New York: Lexington Books, 1991), 137.

⁸¹ Grau and Kip.

⁸² Ibid.

⁸³ Kaplan, 10 - 18.

⁸⁴ Glen, 9. The physical aspects provide numerous locations for protection and allow ground forces to fight below, on, and above the earth's surface. The width of the roads could prevent U.S. forces from using armored and light skinned vehicles for maneuver or support. The winding of the roads could limit line of sight and the use of projected devices for mobility purposes. The buildings may be impervious to, or exceed the capabilities of traditional explosive breaching devices resulting in a reliance on existing entrances rather than improvised ones.

⁸⁵ The less durable materials used to construct modern portions of the city may increase the usefulness and effectiveness of both explosive and non-explosive breaching techniques for entry. The subterranean features may provide undetectable avenues of approach and advance, and obstacles if destroyed or damaged intentionally or unintentionally.

⁸⁶ The use of explosives breaching techniques may be limited since industrial chemicals may be present, but non-explosive techniques could potentially be used due to the use of poorer construction materials during construction of these types of facilities.

⁸⁷ The greater density of personally owned automobiles parked along roads and in areas around buildings may further limit use of military vehicles. Dismounted elements will be required to clear the interior of residences, but the distances between buildings and intervening structures may require the use of armored vehicles to facilitate the movement of troops. The use of explosives breaching techniques may be limited due to the variety of types of possible construction materials and a high probability of collateral damage.

⁸⁸ Kaplan, 10 - 11, 17 - 18, and 31 - 33.

⁸⁹ The lack of city planning in the shantytowns will hinder both mounted and dismounted navigation and movement. The use of explosive and non-explosive breaching techniques may be limited due to the fragile nature of the construction techniques and materials, the close proximity of adjoining structures, and the high population density levels.

⁹⁰ Grau and Kipp.

⁹¹ Glen, 9.

⁹² Kaplan, 24 - 37.

⁹³ Grau and Kipp.

⁹⁴ Podlesny, 53.

⁹⁵ Grau and Kipp.

⁹⁶ Bowden, 54. The great mass of civilians that support the Somalis during the fire fight with the Rangers and Delta Force in Mogadishu are indicative of worst case support a threat can receive in an urban environment.

⁹⁷ Podlesny, 52.

⁹⁸ MOBA, 19.

⁹⁹ Timothy L. Thomas, "The Caucasus Conflict and Russian Security: The Russian Armed Forces Confront Chechnya III. The Battle of Grozny, 1-26 January 1995," *The Journal of Slavic Military Studies*, Vol 10, No. 1, (March 1997), 50.

¹⁰⁰ Funkhouser, Anthony C., *AAN Tactical Roles in Complex Urban Terrain*, Fort Leavenworth, Kansas: School of Advanced Military Studies, United States Command and Staff College – Monograph, December 1998, 14 -15.

¹⁰¹ Lester W. Grau, "Russian Urban Tactics: Lessons From the Battle of Grozny," *National Defense University: Strategic Forum*, (<http://www.ndu.edu/ndu/inss/strforum/forum38.html>), 1995. Accessed 28 June 2000.

¹⁰² Grau and Kipp. Each storm group was a combined arms organization consisting of a motorized infantry company reinforced with a tank platoon, an artillery battery, a mortar platoon, a grenade launcher platoon, an engineer platoon, and chemical troops.

¹⁰³ Ibid.

¹⁰⁴ Grau. Russian engineers removed mines and booby-traps, created passageways between buildings, and emplaced obstacles to impede the movement of Chechen forces in order to provide mobility to the force.

¹⁰⁵ Ibid.

¹⁰⁶ Department of Defense, Office of the Chairman of the Joint Chiefs of Staff, *Joint Military Operations Historical Collection*, (15 July 1997), VI-3.

¹⁰⁷ MOBA, 19. Mogadishu's population was originally 500,000, but additional 1 million refugees migrated to the city by 1993.

¹⁰⁸ Funkhouser, 10. Kismayu's population estimates range from 80,000 to 100,000.

¹⁰⁹ Micheal J. Harris, *Tanks: Fulfilling a Role in Military Operations in Urban Terrain (MOUT)*, School of Advanced Military Studies– Monograph, December 1998, 39. Of particular note to civil affairs and psychological operations planners, U.S. forces in Somalia underestimated the reactions of the Somali people and their ability to mass quickly to impede operations and support the opposing force. In a sense, the ability to prevent or mitigate the effects of the population becomes a mobility issue and capability requirement.

¹¹⁰ Martin N. Stanton, "Task Force 2-87: Lessons from Restore Hope," *Military Review*, (September 1994), 38.

¹¹¹ Funkhouser, 12 - 13.

¹¹² Sheldon S. Kauffman, "Operation Continue Hope: An Update on the Sapper Effort in Somalia," *ENGINEER* Vol. 24, (February 1994), 5. In the absence of organic vehicular mounted mine rollers, engineers fabricated one using a forklift, angle iron, and the road wheels of a tracked vehicle.

¹¹³ Ibid. Engineers attempted to meet the requirement to create an alternate means of entry into a structure by filling a U-Shaped picket with 8 lbs of C-4 explosive. This technique resulted in U.S. casualties within 100 meter of the point of detonation. The need for a mobility asset that can quickly and effectively open holes in interior and exterior walls without causing U.S. or civilian casualties is punctuated by this lesson learned.

¹¹⁴ Harris, 35.

¹¹⁵ MOUT ACTD.

¹¹⁶ Department of the Army, *CALL Newsletter NO. 99-16 Urban Combat Operations* (<http://call.army.mil/call/newsletters/99-16/99-16toc.htm>). Accessed 21 June 2000. For example, reducing obstacles with the mine clearing line charges (MICLIC) requires careful planning and execution in order to minimize the chances of fratricide and collateral damage. The blast and overpressure created by the MICLIC's 1,800 pounds of explosives creates a hazard to unprotected

dismounts and civilians within 200 meters of the point of detonation. Soldiers in adjacent structures and the structures themselves are at risk.

¹¹⁷ Ibid, Executive Summary.

¹¹⁸ Ibid, Chapter 4. Recommendations indicate that dismounted movement should be conducted by blowing holes in walls and moving between buildings rather than along streets while mounted elements follow and support. How the mounted movement is accomplished, and with what resources is not fully addressed.

¹¹⁹ CALL 99-16, Appendix C.

¹²⁰ Harris, 35.

¹²¹ Ernst, Carl F., "MOUT--progress and challenges," *Infantry* 88, no. 3, (September-December 1998), 1.

¹²² Jeb Stewart, "Engineers, Army After Next, and military operations in urban terrain," *Engineer* 29, no. 1 (March 1999), 18.

¹²³ Grau and Kipp. The historical relevance of engineer's in MOUT does not justify, in and of itself, the requirement for engineers or engineer capabilities when the IBCT conducts operations in urban terrain. History, in this case, demonstrates the types of mobility operations and TTP that may be required to ensure tactical mobility, movement and maneuver in an urban environment.

¹²⁴ IAV ORD.

¹²⁵ IAV ORD Engineer Variant. The engineer variant annex to the IAV ORD states that the ESV requires a full width blade and roller. According to USAES, the only likely candidate is the Pearson Plow and Roller. This non-type classified system was field tested by the U.S. Army in Bosnia, but was never fielded. It has limited capabilities. The plow can skim mines on hard surface roads. The roller is track width and can only sustain one mine strike before being destroyed. While documentation of allocation requirements and specific capabilities is lacking, this will provide some mounted reduction and proofing capability.

¹²⁶ Both of these techniques have inherent risk. The lack of armor protection for the DEUCE, and the unreliability of the grapnel hook technique reduce the viability of using them.

¹²⁷ This capability is not listed in the IAV ORD, but under combat conditions it may prove effective as a last resort. The strength of the hull of the vehicle, armor protection, the position of external protrusions (electronics, lights, weapons systems) and ability to extract from the obstacle may limit the usefulness of this technique.

¹²⁸ For single pieces of specialized engineer equipment fifty percent redundancy means 100 percent redundancy. For example, a DEUCE task organized with an infantry unit to conduct a specific mobility task would require a redundancy of half a DEUCE. Since a DEUCE cannot be cut in half, an entire piece of equipment must be allocated to achieve redundancy.

¹²⁹ Depending on the depth of the obstacle, a reduction may require three MICLICs to ensure 50 percent redundancy.

¹³⁰ As defined in Part 1. Feasibility Criteria. Based on the nature of the mobility capability and urban environment, will the use of the mobility capability be effective in an urban environment?

¹³¹ As defined in Part 1. Acceptability Criteria. Based on the effects of the mobility capability and the nature of the urban environment, does the use of the mobility capability minimize any ancillary effects that would prohibit its use in an urban environment?

¹³² As defined in Part 1. Suitability Criteria. Based on historical analysis, lessons learned and mobility capability characteristics, will the use of the mobility capability in an urban environment create the required mobility effect?

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